CHAPTER I

A Selected Review of the Literature

Commentator: Suppose the person next door is driving me
  into a frenzy by incessantly working his new motorized
  lawn mower, or his new motorized hedge-trimmer, or his
  new soil-turner, or something new and motorized, what
  can I do to preserve my sanity?

Pangloss: Why, you can bribe him to stop, or to fit
  silencers to his motors.

Commentator: But is that fair?

Pangloss: Perfectly fair. Why should you interfere with
  his enjoyment without compensating him? Besides which,
  if you can bribe him to stop, both he and you are made
  better off than before. Such a solution is clearly ideal.

Commentator: But suppose I cannot afford to bribe him?

Pangloss: Why, in that case the existing situation is
  already ideal or -- as we economists say -- 'optimal.'

                                    -- from E. J. Mishan

Introduction

In this chapter we trace some of the historical treatment given
by economists to pollution and congestion problems. From the time of
Marshall, it has been customary to place pollution and congestion
under the heading "external diseconomies," a category which came to
hold many of the counter-examples to the assumptions of pure compe-
tition. Although Pigou treated pollution and congestion problems
seriously and at length, later writers increasingly relegated these
problems to footnote status, until the recent explosion of interest.

Now the pathologies of non-convexity and single member "markets,"
the same inherent pathologies which induced earlier neglect, attract
the attention of theorists; at the same time the growth in visibility
and magnitude of pollution-congestion[1] problems attracts practical
economists.

The literature has been enlivened by two controversies, one
associated with Pigou and the other with Coase. We begin with the
first.

The Controversy Over Pigou's Increasing Cost Theorem

The first controversy can be focused by statement of what we
will call Pigou's increasing cost theorem. Pigou held that indus-
tries with diminishing returns are led by competition to outputs
greater than "ideal," and vice-versa for industries with increasing
returns. We may ask what is the connection between pollution-
congestion external diseconomies and diminishing returns. The begin-
ning of the answer comes with Pigou's definition of uncompensated
service.

> I turn now to a group of causes of divergence
> between social and trade net product.... Here the
> essence of the matter is that one person A, in the
> course of rendering some service, for which payment is
> made, to a second person B, incidentally renders ser-
> vices or disservices to other persons, C, D and E, of

---

[1] In Chapter II we shall argue that pollution and congestion are
essentially the same phenomenon. In the meantime we will occasionally
write pollution and congestion in a hyphenated form, as a fore-
shadowing.

> such a sort that technical considerations prevent
> payment being enacted from the benefited parties
> or compensation being enforced on behalf of the
> injured parties [1932, Economics of Welfare, p. 159] .

Pigou gave several examples of uncompensated (dis)services:
porch lamps, industrial smoke, lighthouses, scientific research
[1932, p. 160-1], and highway congestion [1932, p. 194]. Marshall
had previously given the name "external economies" to knowledge
benefiting a firm but generated outside it, [1920, Principles, p. 284]
and "internal economies" to improved organization developing inside a
firm with larger scale. (Many of Marshall's examples of "internal
economies" we would now call examples of indivisibilities.)

Pigou illustrated his welfare theorem with the aid of a high-
way congestion example, which we present in a somewhat altered form:

The first road is short but narrow and subject to congestion.
The second road connects the same two points, but is longer, and so
much wider that it is not subject to congestion. On the congested
road each cart driver gives uncompensated disservices, in the form of
congestion burdens, to the other drivers. With increased usage on
the narrow road, congestion burdens increase and hence the cost per
trip. Thus the narrow road suffers from decreasing returns to scale
of transport activity. The wide road has constant costs per trip or
constant returns. Private calculations would distribute traffic so
"that the trouble involved in driving a 'representative' cart along
each of the two roads would be equal" [1932, Pigou, p. 194]. In
the equilibrium induced by private cost minimization, a man driving
a cart on the congested road would be indifferent if he were shifted
to the broad road; however, other drivers on the congested road would

be benefited. Thus the industry (road) subject to diminishing returns (increasing congestion costs) has output (traffic volume) greater than the "ideal" level.

Pigou drew diagrams similar to:
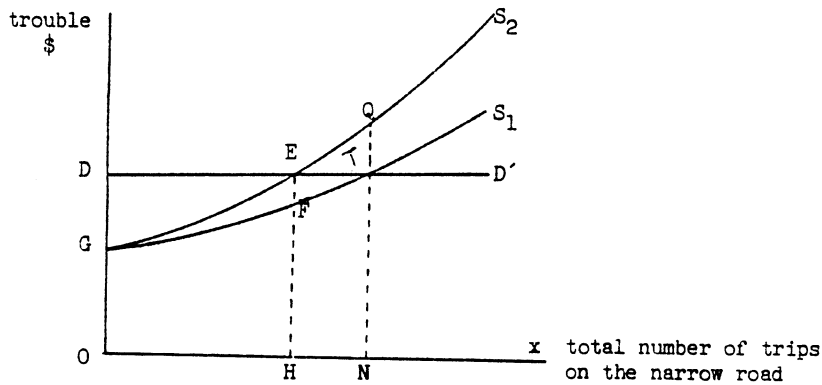
where S_2 is the "curve of marginal supply prices"

S_1 is the "ordinary long period supply curve"

DD´ is the industry demand curve.

For each x, $S_2(x)$ shows the marginal increase in total expenses to the whole industry of cart drivers from producing one more trip. $S_1(x)$ shows the cost of producing a trip for a particular cart driver (firm) as a function of total road usage. The difference between $S_2(x)$ and $S_1(x)$ measures congestion costs that a cart driver would impose on the other cart drivers by taking an additional trip when the total road usage is x.

DD′ shows the number of trips demanded by all "firms" as a
function of the average amount of trouble per trip for each firm.
The demand curve DD′ is determined by the cost structure of the broad
road. The cost per trip on the broad congestion free road is assumed
to be OD and constant for all levels of usage. Consequently for all
costs per trip on the narrow road greater than OD, drivers will switch
to the broad road; and for all costs per trip on the narrow road less
than OD, drivers will switch from the broad road to the narrow road.
Hence the demand curve begins at D and is horizontal.

Since each cart driver will base his calculations of demand
and supply on private costs and benefits, the equilibrium will be at
T. At this private equilibrium, a cart driver shifted to the broad
road will be indifferent as he will gain and lose NT trouble; but
the shift will decrease aggregate trouble by QT.

Pigou thought that his result was quite general. In answer
to our question -- what is the connection between pollution and con-
gestion externalities and increasing cost industries? -- we find that
Pigou believed that any industry with net diseconomies, internal or
external, would have increasing costs. An industry suffering from
congestion costs was just one example of a diseconomy. Each industry
with diseconomies would have an upward sloping S_1 with its marginal
S_2 above and showing "ideal" output less than actual output.

To a modern reader the above example somewhat jarringly mixes
average and marginal concepts as well as industry and firm relation-
ships. Pigou has "something," though, because each cart driving firm
is so small that the average cost to a single driver is the same as

164

his marginal cost. However, the main attention of later writers was
to unravel the relations between supply and cost curves and not to
analyze the problems of pollution and congestion.

While Allyn Young [1913, "Pigou's Wealth and Welfare," p. 683]
went along with Pigou's using a long run average cost curve as a supply
curve, he felt that in the usual case of decreasing returns, a fixed
factor such as land was used more intensively, and hence the LRAC curve
should include increased rent transfer payments. Robertson [1924]
pushed the point further by explicitly treating diminishing returns
to a factor. He held that marginal cost should cover a part of fixed
costs. In the same year, Knight [1924] put Pigou's congestion example
in a completely Ricardian framework. Imagine an entrepreneur owning
the narrow road and charging rent, while the broad road is extra-
marginal and rent-free. While the road owner can set any toll charge,
if he sets a zero charge he gets zero rents and ON usage, and if he
sets a charge above DG he gets zero rents and zero usage. Since S_2 is
a marginal curve to S_1, his maximum rent comes with toll EF and usage OH.

Two insights by Jacob Viner [1931, "Cost Curves and Supply
Curves"] essentially resolved the controversy. The first was that supply
curves were made up of marginal cost curves, not average curves. Young,
Robertson, and Knight were all leading toward this point. The second
insight was that externalities felt through the market may not prevent
Pareto optimality. The most important example is where an industry's expan-
sion raises factor prices. Each firm places disservices on each of the
others in the form of upward-shifted cost curves. Named "pecuniary

diseconomies," these external diseconomies have survived in the liter-
ature until the present. And indeed pecuniary diseconomies, in the
form of upward-shifted cost curves, are sometimes the only kind of
external diseconomies which make their way into intermediate text-
books (see, for example, Leftwich). In making his subclassification
"pecuniary externalities," Viner left room for pollution and conges-
tion in the other subclassification, which he called "external tech-
nological externalities." These externalities were felt directly and
not through a market.

Taken together, Viner's insights demolished Pigou's increasing
cost theorem in its general form. However, Pigou's argument about
highway congestion, perhaps surprisingly, remains intact. In this
particular case the only factor affecting average variable cost is
congestion from the road's total usage. Whether or not a cart driver
makes one or two trips his average cost will be negligibly affected.
So S_1 is also _his_ marginal cost conditioned on the total traffic x as
well as his average cost. If $S_1(x)$ > OD he will switch to the broad
road, otherwise to the narrow road. Without a toll, S_1 is the aggre-
gate self-supply of cart drivers to the narrow road. Thus the conges-
tion example escapes Viner's first criticism: S_1 turns out to be the
proper MC aggregate cart driver self-supply curve.[1] The example
also escapes Viner's second criticism, for the essence of congestion-

_____

[1]From the road owner's point of view S_2, not S_1, is the marginal
cost curve. It is this divergence of viewpoint of marginal curves
that leads to overuse of roads without tolls.

pollution problems is that burdens are transmitted directly, without market transmission. We will call the surviving remnant of the increasing cost theorem Pigou's externality theorem.

While Pigou was quite wrong about external diseconomies in general, one feels a sense of justice that his treatment of congestion survives. For Pigou was one of the few economists to take pollution and congestion problems seriously. He writes, for example:

> It has been said in London, owing to the smoke,
> there is only 12 percent as much sunlight as is
> astronomically possible, and that one fog in five
> is directly caused by smoke alone, while all the
> fogs are befouled and prolonged by it [1932,
> Economics of Welfare, p. 160].

We shall use Pigou's concept of uncompensated disservice as the basis for our theoretical model of involuntary transfers, Chapter II.


Between Controversies

After Pigou, economists generally agreed that pollution and congestion externalities would cause market failure. But instead of framing the problem in terms of uncompensated disservices, it became more common to use the language of capital theory. Knight [1924, p. 586] said these externality problems happen because of lack of ownership of a capital good and Ellis and Fellner [1943, "External Economies"] used the phrase "the divorce of scarcity from effective ownership." Using the same phrase 34 years later, Bator calls these "ownership externalities" [1958, p. 364].

The tendency to analyze pollution and congestion as a problem in capital theory is a movement toward abstraction. We are at one

remove from the primary elements of the problem when we stop talking
about burdens of pollutants and begin discussion of the problems of
ownership of the air. However, the advantage of the growing tendency
to analyze congestion and pollution problems as problems of unappro-
priated capital assets was that this approach lent itself to orthodox
treatment. In work on highway investment, Herbert Mohring completed
the formal analogy of congestion costs to rising variable costs of a
firm, [1965, "Urban Highway Investments"]. Like Knight, Mohring
thought of a highway authority "owning a road," and the rising average
cost per trip attributable to congestion. Modernizing Pigou's diagram
somewhat, we have:
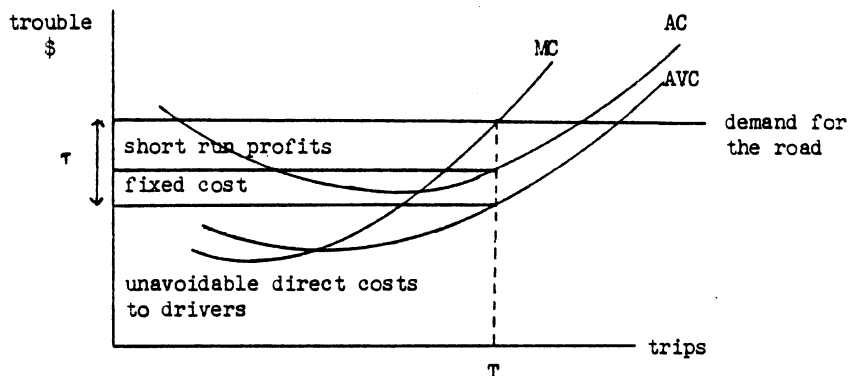
In this short run case, the toll maximizing authority charges
a unit toll of τ. The total τT is enough to provide short run
profits as well as cover the fixed cost of the road, that is, interest
charges and normal profit. The authority takes short run profits

as its cue to build more road, and builds to the point where the
demand curve goes through the intersection of MC and AC, which will
also move. To get factor exhaustion Mohring assumed constant returns
to scale of the production function of

trips = f(capital for road, drivers' efforts).

In this way, Mohring reduced highway congestion to the familiar case
of diminishing returns of a variable factor (drivers' efforts) to a
constant one (road capital).

We note that if the number of trips for an individual is
large, he will not use the AVC curve as his personal MC supply curve.
Thus, as with Pigou, Mohring's formal analogy is only useful if the
participation rates of decision makers are small relative to the whole
congestion activity.

Mohring's treatment of the highway example is another step
toward "conceptual internalization" of the externality problem, because
the road asset owning firm thinks of the total sum of congestion burdens
as a single opportunity cost affecting his maximum rent collection.
The externality item, which is the focus of interest, slips out of
view by becoming an implicit part of the analysis.

A more symmetrical capital theory approach was developed by a
student of Mohring's, John Hayden Boyd, in his dissertation. An asset,
like a road, gives one type of service -- trip capacity -- to many
people. It also gives disservices to those that don't like roads.
Similarly, a river gives "pollutant removal services" as well as
swimming services. We can imagine a matrix A, whose typical element

A_{ij} specifies the amount of service i provided to firm j. The feasible set of asset service combinations is given implicitly by $r(A) \equiv 0$, where r is some function. The analogous procedure to maximizing rent in Mohring's highway problem is for society to perform a cost-benefit maximization, constrained by the feasible set of environmental service interactions. For Boyd each user of an asset service should pay for that service. Chemical plants should pay in relation to the opportunities they foreclose to swimmers, and swimmers should pay in relation to the opportunities they foreclose to chemical plants [1967, pp. 13-17].

As we have just seen one branch of analysis led to a treatment of congestion as a branch of capital theory. A second branch of analysis attacked the problem of existence for increasing return and decreasing return industries. In the group of papers "on those empty boxes" congestion and pollution problems were generally neglected, and their importance minimized. Robertson said there were "no sich persons" as external diseconomies [1924, p. 155]. According to Viner,

> External technological diseconomies...can be
> theoretically conceived, but it is hard to find
> convincing illustrations. One possible instance
> might be higher unit highway transportation costs
> when an industry which provides its own transporta-
> tion for materials and products expands its output
> and thereby brings about traffic congestion on the
> roads [1931, p. 221].

Part of the reason for Viner's trouble finding illustrations comes from his narrow definition of external technological disecon-omies: "Increasing technical coefficients of production as output

of the industry as a whole is increased." Air pollution in the
Ruhr Valley which cut labor's efficiency would be an external tech-
nological diseconomy, but not the air pollution affecting people
not working in the polluting industry. Thus Viner's definition
cuts Pigou's uncompensated services into two parts, and pollution
and congestion costs are considered costs only when they affect
production costs of the industries originating these burdens.

In "Problems of Industrialization," Rosenstein-Rodan pointed
out that while potential business activity which affected another
man's profits through the market will not prevent Pareto optimality
in a competitive world close to equilibrium, it _can_ do so in an
economy far from equilibrium. A subway that should be built, may
not be built by a private company which owns too little of the
surrounding land and is unable to capture enough of the spillover
benefits. In broadening the category of external economies to
include what Scitovsky later called pecuniary externalities,
Rosenstein-Rodan was going back to Pigou's general concept of
uncompensated services [1943].

In "Two Concepts of External Economies," Scitovsky [1954]
clarified the distinction made by Viner between pecuniary external-
ities and technological externalities, which basically fall into
his new category of direct, nonmarket interdependences. This new
category was divided into four parts -- consumer to consumer,
producer to consumer, consumer to producer, and producer to producer.
Of these four, Scitovsky thought only the first really important.
The second group of interactions, producer to consumer, is the

group in which we will be most interested. As an example of this
type of interaction Scitovsky produced the old Pigovian example of
the "factory that inconveniences the neighborhood with the fumes or
noise that emanate from it" [p. 144]. However, these cases of

> direct interdependence...seem exceptional and un-
> important...because most instances of it can be
> and usually are eliminated by zoning ordinances and
> industrial regulation concerned with public health
> and safety [p. 144].

To Scitovsky the category of nonmarket interdependence of
producers to consumers was nearly empty and those unimportant items
which were in the category easy of solution. Scitovsky wrote just
two years after the London smog which killed 4,000. The SST debate
was 15 years away.

As we have seen, economists after Pigou tended to minimize
the importance of pollution and congestion problems. As a
final example of this neglect we may take Bator's "The Anatomy of
Market Failure" [1958]. After a review of some of the historical
treatment of externality problems, Bator classified direct exter-
nalities into a category of ownership externalities, which he felt
inclined to argue was "of small import" [1958, p. 377]. Presumably
pollution and congestion fall into this category. Oddly while the
problems of pollution and congestion were ignored, the Pigovian
solution of taxes and bounties was accepted quite generally. The
situation remained this way until in the early 1960s a group of
economists began to say that the Pigovian remedy had been accepted
quite uncritically as well. Thus began the second controversy.

The Controversy Over Coase's Neutrality Theorem: the Case for Coase

Pigou has recommended a tax on an economic agent who imposes uncompensated disservices on others. After Viner, as we saw, the tax solution was amended to apply only to "nonmarket transmitted uncompensated disservices." In this form the Pigovian solution remained unchallenged until 1960 when Coase published his watershed article attacking what he called the Pigovian "oral tradition" [1960, Coase, "The Problem of Social Cost," p. 39].

(1) Coase began by undermining the asymmetry of uncompensated disservices:

> 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 reciprocal nature. To avoid harm on B would inflict harm on A [Coase, p. 2].

Coase illustrated this reciprocal nature by the following legal case:

> [A] confectioner used two morters 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 the neighboring premises. 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 [pp. 8-9].

At this point "to avoid harming the doctor would inflict harm on the confectioner" [p.2]. As Demsetz later put it, "The ethnical symmetry of the problem should be underscored"[1966, p.68].

(2) Coase argued for what we will call the "Coase neutrality theorem." Basically this theorem says that with a clear definition of property rights and encouragement to bargain, a Pareto optimum would be reached without government interference of Pigovian taxes. Furthermore, "With costless market transactions, the decision of the courts concerning liability for damage would be without effect on the allocation of resources" [1960, Coase, p. 10].

Ralph Turvey [1963] demonstrated the theorem with a diagram.
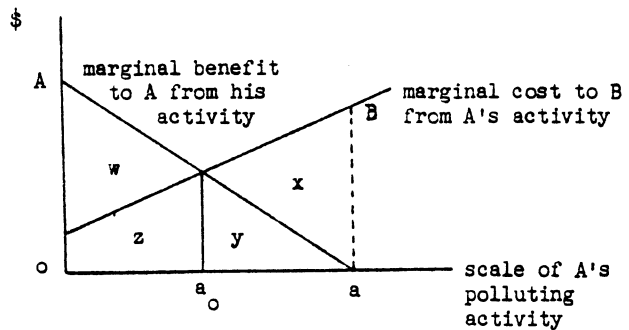
Suppose A is the polluter and B the unwilling receiver. With the right to pollute defined and given to A, the polluting activity will be operated at level a, as long as there is no chance to bargain. But with opportunity to bargain, B will be willing to pay up to x + y and A will be willing to receive at least y to negotiate the activity level to a_o. With the definition of rights reversed, A will be willing to pay up to w + z and B will be willing to receive at least z to set the activity at a_o. With either definition of rights the allocation of activity is the same.

(3) Damages would be computed from the fall in rent accruing to the damaged activity, not to the total loss in product. Variable

factors of production will find productive work elsewhere and so
their loss in contribution to total product will be netted out by
a gain somewhere else. A problem with this scheme of accounting is
that only the first variable factor moves away at zero opportunity
cost. As we move beyond what was the marginal factor, variable
factor opportunities will decrease, due to diminishing returns
from the fixed factors in other activities. This point becomes
important for pollution problems which affect a large amount of
resources.

(4) Coase finished his attack on Pigou by turning one of
Pigou's own examples against him. If a railway is forced to com-
pensate farmers for fires caused by the railroad, farmers will be
indifferent between planting next to the railroad and collecting
compensation and taking the socially optimal action of moving some
of the planting away from the railroad. Thus, according to Coase,
not only is the Pigovian solution unnecessary (point 2), ill-
defined in terms of equity (point 1), but is also sometimes non-
optimal. This last point seems to be self-damaging for Coase, since
Pigovian compensation is equivalent to Coase's bargaining, under the
specialization of price-taking behaviour of both parties. However,
we may anticipate a result of Chapter II and state that Pigovian
compensation should be paid on the basis of damage after defensive
strategy is taken by the pollution receiver. Alternatively we can
use Coase's language and his own (3) to observe that since the rail-
road's liability should only cover loss in rents the farmers won't
be indifferent about location of perishable variable factors.

Since the farmers aren't totally indemnified the incentive remains for them to take defensive strategies. Thus both Pigou and Coase are saved from this last criticism, which we dismiss as a slip of the pen.[1]

In "Politics, Policy and the Pigovian Margins," Buchanan [1962] pushed the attack further. The same selfishness in man that leads a polluter to ignore the costs he imposes on others will prevent a majority rule government from setting the proper Pigovian taxes. For a dominant coalition will push their political activity too far in order to exact benefits from the minority. The Pivogian divergence between social and private (decision maker's) costs applies to political decisions as well as private market ones. On the other hand, if we imagine man altruistic, the polluter will make his decision on the basis of social costs, so the need for Pigovian taxes vanishes. To imagine man selfish in his private life and altruistic in his social life would make the Pigovian remedy more feasible but, to Buchanan, this conception is "rather naive" [p. 25].

While his point makes Pigou's pollution-congestion remedy seem infeasible, Buchanan's attack encompasses all decision-making by majority rule. So instead of making Pigou's analysis "practically worthless" [p. 25], Buchanan showed that Pigou had a valuable insight about legislative process. Indeed in Calculus of Consent Buchanan used a Pigovian divergence between district welfare and the social

---

[1]See, for a discussion of Coase, Mishan, E. J., "Reflections on Recent Developments in the Concept of External Effects," Canadian Journal of Economics, February 1965, pp. 29-32. On p. 29 Mishan appears to accept the Coase neutrality theorem. His later papers are much less favorable to the theorem.

welfare to argue that Congress votes in too many public goods.

In "Externality," Buchanan and Stubblebine [1962] intro-
duced several distinctions (marginal and infra-marginal, potentially
relevant and irrelevant, and Pareto-relevant[1] and Pareto-irrelevant)
which helped make the analysis of externalities more explicit.
After considering a parametric definition of externality (see p.
7 for example), they decided upon the definition used by Meade [1952]
in which the externality items appear as arguments in utility and
production functions. Ignoring income effects, they developed
optimality conditions identical to Samuelson's condition (2) in his
"The Pure Theory of Public Expenditure" [1954]. And finally they
used their framework to undermine Pigovian intervention. First,
they noted that external effects exist at a Pareto optimum. Thus
"there is not a prima facie case for intervention in all cases where
an externality is observed to exist" [1962, "Externality," p. 381].
Second, Pigovian taxes which aren't paid on a marginal benefit basis
to the sufferers will prevent Pareto optimality. The sufferers will
bribe the polluters past the optimum points induced by Pigou's tax.
This oversight, Buchanan and Stubblebine affirm, happened because
"Pigovian terminology...deals with the acting party to the exclusion
of the externally affected party" [p. 381]. In agreement with Coase's
idea of reciprocity, they wrote "the externally affected party must

---

[1]Pareto-relevant is defined to mean that the externality activity
could be modified to leave everyone better off.

compensate the acting party for modifying his behavior" [p. 381].
While they seem here to assign the status quo right to the polluter,
they later argue the Coase theorem: "The same 'solution' will tend
to emerge out of any externality arrangement, regardless of the
structure of property rights, provided only that the market process
works smoothly" [p. 383].

  Davis and Whinston [1962, "Externalities, Welfare, and the
Theory of Games"] made the distinction between separable and non-
separable cost functions (a separable cost function has a marginal
cost which is a function of the firm's own output only), and then
they pressed on with the attack. They pointed out the practical
difficulties of the government estimating damage curves in the
separable case and the game-theoretic indeterminacy of the non-
separable case.

> The main point of our argument has been that the
> "classical" tax-subsidy solution to the problem of
> externalities on the production side would be
> difficult to achieve in the dominance [separable]
> case and impossible in the non-dominance [non-
> separable] case even if the government could be
> assumed to be trying to maximize welfare (p. 261).

  While Davis and Whinston offered a few suggestions for estimat-
ing Pigovian incentives, their main suggestion was to merge inter-
acting firms. They did admit that mergers would have costs of their
own, in terms of loss of competition.

  Turvey [1963] summarized and reaffirmed the position of
Buchanan, Stubblebine, Otto Davis, Whinston and Coase. And then
Turvey pushed the attack a step further by an example that did not rely
on game theoretic strategic behavior, non-separable cost functions,

congressional pork barreling or side payments. Suppose a firm A
has a choice of one of two smoke stacks, and choice of the emission
level. A Pigovian tax equal to marginal damages may lead to the
socially wrong choice of stacks.
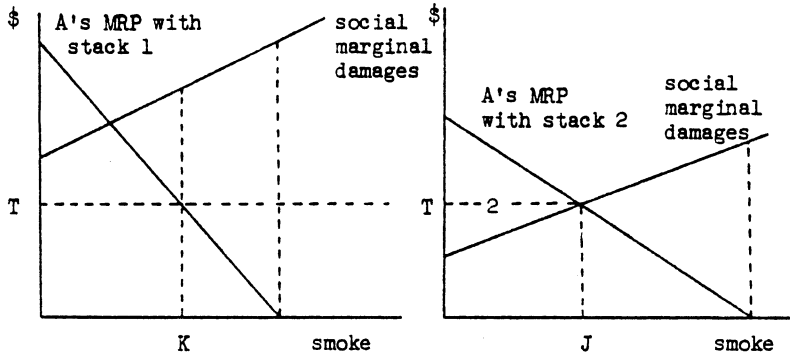
Since area 1 < area 2, the socially optimal choice is stack
2 operated at level J. However, announcement of optimal tax T induces
A to choose stack 1 and operate it at level K. Thus even in the dream
world of full knowledge of the damage function, and without the complica-
tions of Buchanan et al., Pigovian taxes by themselves may not induce
the proper activity. "There is no need to carry the example any
further. It is now abundantly clear that any general presumption of
a tax to deal with external diseconomies is useless" [1963, Turvey,
p. 312].

The cause of the pathology in this example is the mutually
exclusive nature of the activities and not the externality. We
shall come back to this example in the next chapter.

179

The Pigovian counterattack began somewhat inauspiciously in
1964 with Wellisz' "On External Diseconomies and the Government-Assisted
Invisible Hand" [1964]. Wellisz was simply wrong in saying that
separable externalities are not Pareto relevant and his construction
of Pigovian taxes for non-separable mutually interacting firms gives
weight to the anti-Pigovian claim that Pigovian taxes require too much
information to calculate. However, his attacks on the bargaining
solution were more convincing.

First he raised the question about the status quo point. If
the polluter is liable for damage the status quo point is zero and is
well defined. Mr. B has no way to argue that it is "really" less
than zero and he has no incentive to claim it is "really" greater than
zero. There is no way for B to bluff about the pre-bargaining point.
Not so if the pollution rights rest with A. A can claim that
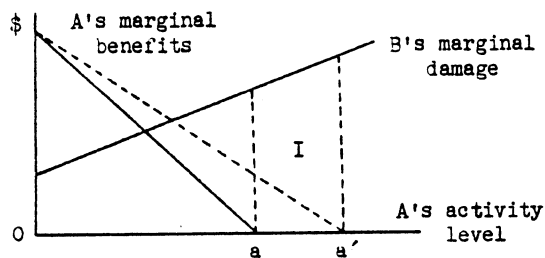
demand has just risen for his product and hence the status quo point
is not a but "really" a′. A has the strong incentive I to bluff.
Thus the bargaining limits are not well defined and the pre-bargaining
status quo points are not symmetrical. Moreover, a Coase solution
that indifferently allocates rights to the polluter "opens up

magnificent business prospects: any activity can be turned to profit as long as it is sufficiently annoying to someone else" [1964, Wellisz, p. 353]. While a Pigovian system is impersonally neutral and a judication system "tends to compensate the victim, the bargaining process compensates the threat-making party, and one can hardly claim that threat making deserves reward" [p. 361].

Even without these difficulties, Wellisz argued that private bargaining applies "only to exceptional cases" where the number of affected parties is very small. With large groups bargaining will be infeasible and we will be stuck with the status quo, pre-bargaining situation.

There is no problem in not moving from the pre-bargaining position, counter argued Demsetz [1964, "The Exchange and Enforcement of Property Rights"]. The Coase theorem applies broadly. If the transactions costs are too high for a negotiated change, the present situation is already Pareto optimal.

With transactions costs, the post-bargaining allocation depends upon the initial definition of rights. Demsetz first fell back on the "ethical symmetry" of the problem. "To allow the [externality] action will benefit group 2 and harm group 1. To disallow the action will benefit group 1 and harm group 2" [1966, p. 69, "Some Aspects"]. Ethical neutrality means that there is no preferred way to assign rights. But Demsetz then suggested that the initial assignment be made such that reassignment costs, which result from activity level changes from bargaining, be minimized.

On the other hand, Demsetz suggested that an externality situation might become optimal without need for bargaining or any government interference. Moveable factors will move from a smoky factory at no real costs and fixed factors will be negatively capitalized.[1] To Demsetz, technological externalities have become pecuniary externalities and the hard won distinction between the terms becomes blurred.[2]

Davis and Whinston, in "Some Notes on Equating Private and Social Cost" [1965], again discuss the bilateral case, this time between consumers. They mention four possible policy alternatives -- ignore, Pigovian taxes, merger, and bargaining -- but go on to develop a bargaining solution only. The process is one of tatonnement and has some relation to the Pigovian solution, as well as avoiding strategic game-theoretic behavior. Their conclusion is the Coasian one "that there seems to be no economic or efficiency argument to favor one status quo point over another" [p. 125].

Plott, in "Externalities and Corrective Taxes" [1966], raised the point that a Pigovian tax must be placed on the effluent emission, not upon the good for which the effluent is a factor of production. (This point will be illustrated in the model in Chapter II.) Plott showed that a tax on paper instead of smoke would lead to more smoke if smoke was an inferior factor of production. The point is something

---

[1]Negative capitalization is the process in which a disamenity attached to an asset lowers the price of the asset.

[2]See "The Exchange and Enforcement of Property Rights" [p. 25].

of an aside in the controversy over the Coase neutrality theorem,
although it is a point well worth making, since Plott found several
examples, by eminent economists, where a Pigovian tax on the good
is carelessly recommended.

In the same year Davis and Whinston [1966] replied to Wellisz.
After demonstrating that Wellisz was wrong in saying that separable
externalities do not effect allocation, Davis and Whinston found
problems with Wellisz' Pigovian solution. It was too information-
demanding; involved highly non-linear estimation, and had no guarantee
for determinacy once off equilibrium. Interestingly, they then went
on to develop their own iterative Pigovian solution, again limiting
themselves to two firms with mutual externality interactions. Their
idea was to create incentives for each firm to reveal information about
external costs, while the government played a passive intermediary role.

In Wellisz' terminology, Davis and Whiston put themselves on
the "modern-old" (anti-Pigovian) side of the controversy by concluding
that even their sophisticated Pigovian proposal had problems and that
Pigovian taxes were no panacea. But they took the balanced position
that mergers, bargaining, property rights definitions also had
problems. "Much research in this area is needed, not only to discover
new policy alternatives, but also to determine the practical and
theoretical difficulties associated with known alternatives" [p. 304].

In summary, the anti-Pigovians can be credited for helping to
winnow down ambiguities associated with pollution and congestion exter-
nalities. They have contributed to the much needed research, which
Davis and Whinston called for, and in the controversy, they have

revived academic interest in externalities. Externalities are no longer neglected in the literature, partly because of their efforts, and partly because of the growing magnitude of the problems. The Coasian position can be briefly summarized -- do not interfere -- private bargaining, mergers, and negative capitalization will happen automatically without interference. Define property rights and decentralized private decision makers will, by themselves, minimize the social costs of externalities. But this passive faith in non-interference became less attractive as pollution and congestion problems became progressively and visibly worse.

The Pigovian Revival: the Case against Coase

The Pigovian revival can be conveniently divided into three stages. In the first the Coasian model was accepted as formally valid but the Pigovians argued that the assumptions were unrealistic and the solutions unworkable. In the second stage the model itself was found deficient. And in the third Pigovians, moving onto ground rough for economists but perhaps stimulated by Coasian claims of ethical symmetry, brought ethical problems directly into the discussion. These stages, we hasten to add, are only partially distinct chronologically, Wellisz, for example, made his argument on all three levels.

One of the most vulnerable aspects of the Coasian position was that the discussion took place in a two party world. Kneese [1964] pointed out in the Economics of Regional Water Quality Management that water pollution involves very large numbers of affected parties [p. 46]. For a river basin with hundreds of polluters and millions

affected, it is inconceivable for all the affected parties to get together to bargain privately. The effects of air pollution are even more diffuse, and typical commuter congestion problems involve hundreds of thousands.

While not writing about pollution-congestion problems directly, Mancur Olson contributed to this insight in his Logic of Collective Action [1964]. Olson argued that large groups behave fundamentally differently than small ones. Some or all members of a small group may have incentives to bear the costs of bargaining themselves, since the benefits of negotiation may be very concentrated. But for larger groups the benefits of a negotiated settlement become more spread out, and the benefits to any particular individual may be less than the costs of bargaining for him, if he takes an active part in negotiation. It may be to the advantage of each affected member of the group to become a free rider on the others' efforts.

As for a property system interpreted through the courts, Kneese found major obstacles: The courts' delay and great cost in litigation; the impossibility of rounding up all the affected parties to press their claims together (greater acceptance of class action suits is an improvement); and the rigidity of court judgments which cannot handle variability in pollution conditions [1964, Kneese, p. 47].

Besides direct negotiation and court litigation, another automatic "decentralized" solution offered by the Coasians was merger. This solution is of course impossible for externalities from polluters to consumers, the most important case for air and water pollution. And merger of all the firms sharing a river basin or air shed is too

highly anti-competitive to be considered [1964, p. 48].

Another Coasian solution was to ignore the problem and let the market negatively capitalize the burdens. Although Demsetz suggested this possibility [1964, p. 25] and Davis and Whinston mentioned it [1965, p. 113], negative capitalization has not drawn much attention in the literature, perhaps because doing nothing in the face of growing pollution-congestion problems is not a satisfying policy recommendation. (All the Coasian solutions were subject to the charge that they were "do nothing" policy recommendations. "Ignore and let the market negatively capitalize" is merely the most obvious case.) Mishan did criticize this solution on the grounds that it could only work in a world where "pollutants are concentrated in certain areas, say urban areas; in which the question of justice is irrelevant, and in which there are no future generations to consider." In short, not in this world.[1]

As the assumptions of the Coasian world were found not to apply to the real world, except in exceptional cases, and consequently the Coasian solutions generally not to work, Pigovians saw a justification for government initiative. External costs of pollution-congestion were large and growing, and the Coasian solutions, which were supposed to happen automatically, were just not happening. Some form of public

---

[1]See "Pangloss on Pollution," _Swedish Journal of Economics_, 1971, p. 115. Mishan is applying these requisites both to the case of bargaining and the one where transactions costs are too high and negative capitalization makes the adjustment.

regulation, either standards or fees, was felt to be needed, "despite the costs and distortions which may be entailed in the regulation itself" [1964, Kneese, p. 55]. Demsetz had taken a failure to bargain as evidence that the situation was already Pareto optimal; Kneese argued the contrary by demonstrating that an effluent fee system in the Ruhr had in fact increased welfare.

The first stage of the Pigovian revival was to challenge the applicability of the Coasian approach. Once inside the two party Coasian world, the conclusions were thought to be valid.[1] The second stage went further to argue that the model was invalid, even in the context of its own assumptions.

Coase had said, in a world with zero transactions costs, and well-defined property rights, allocation of product will be invariant to allocation of property rights. Not so, said Dolbear [1967], for allocation of property rights affects income and income affects allocation of product. Dolbear's point, while a general one, is most obvious when the two parties are two consumers. Mishan later made the same point in "The Postwar Literature on Externalities: An Interpretative Essay" [1971B, p. 18-21] and "Pangloss in Pollution" [1971A].

Even after assuming away income effects, Kamien, Schwartz, and Dolbear showed that distribution of pollutant rights can have resource

---

[1]See Mishan, "Reflections" [1965, p. 29]; Kneese, Economics of Regional Water Quality Management [1964, p. 44]; and Kneese and Bower, Managing Water Quality [1968, p. 101].

allocational effects [1966]. They analyzed the case of a firm which
creates a waste residual in direct proportion to a marketable good Q.
The firm can treat its own raw waste at a cost or dump it in a river.
There is a downstream "authority" which can treat the waste at a cost
and also can charge or bribe the polluter. If the authority chooses
a fee system, it can charge the polluter a fee equal to the authority's
treatment cost plus damage caused by the still harmful pollution. If
the authority chooses a bribe system, it can pay the polluter for each
unit of pollution abated, on the basis of the damage and authority's
treatment cost avoided. The problem with the bribe system is in
choosing the status quo point from which to measure pollution avoided.
A bribe system is equivalent to a fee system with a lump sum bribe,
determined by the status quo point, added on.[1] If the authority
defines the status quo point in terms of the amount Q produced and
raw waste generation, it places a value on the firm's increase
of raw waste and primary product. In this case Kamien, Schwartz, and
Dolbear demonstrated that under a bribe system the firm's generation
of effluent will be at least as great as that under the charge system;
and in fact, with an increasing marginal damage function, the most
important case, effluent generation will be greater under a bribe
system than with no "incentive" system at all. On the other hand if
the authority chooses to set the status quo point once and for all

---

[1]See Freeman [1967] for general definitions of bribes, charges,
and lump sum bribes, which are A in his notation.

time, Kamien, Schwartz, and Dolbear show that a rise in demand for
the product Q may make it worthwhile for the firm to forfeit the bribe
altogether and not treat its waste at all.

The trouble, of course, lies in the fact that there is no
natural pollution origin with which to compute the lump sum bribe.
In one case valuable pollution rights can be acquired just by choice
of activity. In the other case the status quo point may become
obsolete and not maintain the proper incentive. With the polluter
liable this problem does not arise. As we saw, Wellisz pointed out
this asymmetry, as also did Edwin Mills [1966].

Mishan [1971A] pointed out another asymmetry. Since transac-
tions cost is a barrier, in the Coasian world rights favoring the
victim will lead to a Pareto solution of less effluent discharge
than one with rights favoring the polluter. A risk averse society
would be wise to err on the low side since a little too little pollu-
tion would not hurt very much while a little too much could lead to
catastrophe. Also rights favoring the victim create greater incentives
for new pollution-free technology.

When we go beyond a two-party world to consider whole industries
which pollute, a bribe system may lose the Pareto optimality altogether.
As a practical matter to be eligible for a bribe, a firm may have to
belong to the polluting industry. In this way lump sum bribes can
allocate inefficiently between industries.

An example of allocational inefficiency between industries is
the cotton subsidy program. Suppose there are two industries: a potato
industry and a non-growing-cotton industry. A farmer, after examining

both industries, decides to join the latter. He enters simply by threatening to grow cotton. Once inside the not-growing-cotton industry, compared to the other farmers in the industry, he is efficiently using resources. However, the not-growing-cotton industry itself keeps growing, until formidable barriers to entry are set up.[1] Efforts to make the lump sum bribe truly a lump sum transfer, that is to define the status quo point independently of any action, will lead to permanent inequities.

The Coasian idea of allocational neutrality has been shown to have intrinsic problems of its own. Underlying this idea of allocational neutrality is the idea of ethical neutrality. To the Coasians it makes no sense to separate polluter and victim for the situation is reciprocal: if A harms B, then to prevent A from harming B is to harm A. The only criterion is the total social product under different arrangements. The third stage of attack on the Coasian position was to be an attack on this ethically neutral foundation.

We may start with the ethical question of inequity just alluded to. The ethics of marginal distribution of income has been defended on the grounds of merit, as well as on the grounds of allocational efficiency. Those who work hard and contribute more should get more. Besides having allocational efficiency, the effluent tax system is consistent with this merit principle. The polluter cannot claim he merits a reward for the generation of smoke, which is a factor of production. The receivers of smoke have borne this cost of production.

---

[1]Bramhall and Mills [1966] allude to this inter-industry market inefficiency.

190

As we shall see in Chapter II, to a firm smoke is entirely analogous

to labor as a factor of production, and the labor supply curve is

analogous to society's smoke acceptance curve. Just as labor supply

involves sacrifice by workers, smoke acceptance involves sacrifice by

smoke receivers. With an effluent tax a firm pays for the valuable

service (to the firm) of smoke acceptance, just as with a wage the

firm pays for valuable labor.

In the present system with neither bribes nor fees the advan-

tage of pollution from the use of underpriced services is largely

competed away. And with free entry and exist between industries after

institution of a fee system, the new disadvantages of being a polluter

will be competed away also. This is not true for a bribe system, which is

basically a fee system with lump sum bribes. These lump sum bribes

have the same value as British consols. If the lump sum bribes are

truly lump sum transfers, they will not be competed away. The ethical

question is this: why should a polluter become wealthy, from his

"consol," just because he happened to be in a position to place

involuntary burdens on others? And if the lump sum bribes are made

conditional on membership in the polluting industry, the economy is no

longer Pareto-efficient, so that the merit system of marginal distribu-

tion is distorted.[1]

A second ethical question goes back to the 19th century concept

---

[1]See Page, "The Failure of Bribes and Standards for Pollution
Abatement," forthcoming in the Natural Resources Journal, October, 1973,
for an elaboration of this idea.

of freedom articulated by John Stuart Mill. A person is free, said
Mill, to take any action unless it harms another past a reasonably
low limit. Thus Mill's concept makes a distinction between the active
and the passive party. As a result of this asymmetrical concept of
freedom, our court system devotes a great deal of its effort to
defining a "reasonably low limit."

Mishan pointed out that in nearly all pollution problems the
polluter is the active party and the receiver is passively the victim.
The polluter voluntarily chooses to transmit the pollutant. The
receiver involuntarily receives the burden or dis-agreeably takes
a costly defensive strategy. The second ethical question is: how
much should our understanding of the pollution-congestion problem
be conditioned by this asymmetry between active and passive parties?
The Coasians argued not at all. But then how far are the Coasians
willing to push ethical neutrality? Mishan gave the example of a
thief trying to rob his house. Would a Coasian try to stop him, in
spite of the fact that in doing so he would harm the thief. And would
a Coasian weigh on an equal scale the potential utility loss the thief
would suffer if prevented from his activity with the potential loss of
the passive victim? Would Coasians draw the line by what is defined as
lawful? If so we may point out that asymmetries between active and
passive parties, in conflicts from pollution-congestion cases, have
been, on occasion, incorporated into law.

Kneese and Bohm pointed out another ethical asymmetry in timing.
Especially in water rights questions precedence has been given to those

who got there first. Presumably the second arrival has knowledge of
the disamenity. Thus residents who moved around an airport and who
try to force noise pollution abatement are looked upon with less
sympathy than those residents who were there before the airport was
built. Prior appropriation has its appeal in the idea that the second
arrival can take advantage of the negative capitalization of the dis-
amenity caused by the first arrival. Although prior appropriation,
which is essentially a doctrine of squatter's rights, seems less
sound than Mill's doctrine of freedom, prior appropriation has also,
in fact, been used in law.

It is interesting to note that Coase's example of the con-
fectioner and doctor used both conditions. The "polluter" (confec-
tioner) was there first and the victim took the active role in
encroaching upon the polluter. Thus Coase's example plays toward
our moral sympathy. In this most favorable case even a Pigovian
might side with the confectioner. Ironically the court sided with
the doctor.

In "The Economics of Congestion and Pollution: An Integrated
View," Rothenberg [1970] defined both congestion and pollution as
interference from overuse of a medium. Unlike Boyd, who thought both
swimmers and paper factories should pay user fees, Rothenberg made
the distinction "between destructive and constructive uses of a medium,
between guilty and innocent parties. Significant -- whether morally
or in scope -- income redistribution is a key aspect" [p. 3]. "There
is an important asymmetry between those who spew gases into the air

and those who only want to breathe it. The former do at least poten-
tial ill to the latter, but the latter do not do damage to the
former" [p. 4]. The distinction between constructive and destructive
uses is not a clear-cut one, and, as resort towns have found out,
hordes of swimmers can indeed physically pollute the water. Yet there
are large asymmetries in the physical damage done to a medium by
different uses. In Boyd's model this asymmetry in damage plays no
role; the optimal fee for one user is computed on the value of oppor-
tunities foreclosed to the other potential users. The ethical ques-
tion is: how much should asymmetries in physical damage to a medium
(environment) be taken into account?

We can push the ethical asymmetry a step further to go beyond
economic rights, which not only Coasians but all other economists
treat as commodities, to ethical rights. Certain ethical rights are
more basic than others. It is hard to think of rights more basic than
the ones to breathe unpoisoned air, eat unpoisoned food, and drink
unpoisoned water. Freedom from bodily assault by cadmium, arsenic,
and mercury is a right on the same order of basicness as freedom from
bodily assault by a robber. A strict reading of Coasian doctrine would
say the right to abridge these rights is on the same "ethical footing"
as the rights themselves. Few people, besides doctrinaire economists
who do not believe in ethical rights at all, will agree that this is
true.

"With costless market transactions, the decision of the courts
concerning liability for damage would be without effect on the
allocation of resources" [1960, Coase, p. 10]. Coase's own statement

of his neutrality theorem is elegantly simple. It was later elaborated
by his followers into a doctrine of non-interference and ethical
symmetry. It now seems clear that the Coasian doctrine has actually
fared worse than the Pigovian one it was intended to replace. With
the benefit of hindsight, we may say that the Coasians were misled
most of all by their preoccupation with the two firm case of mutual
interaction. Turvey has written, with some justice, of the Pigovian
tradition: "The notion that resource-allocation effects of diver-
gences between marginal social and private costs can be dealt with
by imposing a tax or granting a subsidy equal to the difference now
seems too simple a notion" [1963, p. 309]. Of the Coase-inspired
doctrines of ethical and allocational symmetry, private bargaining
and non-interference, and neutrality of the status quo point, we must
make the same judgment.

Recent Developments

While the Coasian position is now increasingly challenged,
the Pigovian revivalists are by no means reinstated, indeed, in spite
of the Pigovian criticisms, the Coasian doctrine is still "persistently
recommended," as Peter Bohm puts it [unpublished paper, "A Note on the
Logic and Feasibility of the Taxation Solution to the Externality
Problem, p. 19]. For example, Paul Burrows[1970] first derived the
Coase theorem for the case of two parties, tacitly assumed to be
playing symmetric roles, and then applied the theorem to the case of
an oil spill on the English resort coast. This transition is an

excellent example of inapplicable application. Burrows then went on
to point out the infeasibility of private bargaining.

Also recently, Bish developed his chapter, "Externalities,
Public Goods, and Collective Action" in terms of Coase's theorem,
which he weakened to avoid bargaining costs and income effects.
Coase's doctrine of ethical neutrality left the question of alloca-
tional rights unsettled. Yet Bish defined the cost of air pollution
in terms of what "individuals are willing to pay to have pollution
reduced in order to consume clean air" [1971, p. 122]. Thus Bish
implicitly assigned rights in favor of polluters.

Azriel Teller stressed the Coasian reciprocity as well.
"Because they [people] demand the resource air to be of a certain
quality, they are imposing a cost on industries that also use this
resource" [1967, p. 41]. And then he too went on to measure the demand
for clean air in terms of "people's willingness to pay" for it [1967,
p. 42].

Why define the cost of pollution as the pollution receivers'
"willingness to pay" for a cleaner environment and not the "minimum
compensation" polluters must pay to indemnify the receiver? This too
would measure the cost of pollution, but the latter is from an opposite
point of view. While ethical neutrality should make Coasians unable
to choose between the two concepts, they consistently use the former
one favoring the polluter.[1] When Demsetz argued that a pollution
situation with the costs of private bargaining too high for negotiation
was already Pareto optimal, Mishan [1971B, p. 17] replied that

---

[1]There is a "hold-out" problem with minimum compensation,
but not for polluters' willingness to pay for disposal opportunities.

"rationalizing the status quo in this way brings the economist perilously close to defending it." Here with their choice of concepts, the Coasians seem to be actually defending the de facto right to pollute.

Not only are there still active Coasians, but some are still attacking the Pigovian solution. Recently, Buchanan wrote a note which was "presented as a contribution to the continuing dismantling of the Pigovian tradition in applied economics" [1969, p. 174]. Buchanan discussed the case of a polluter, who is also a monopolist operating at below the socially optimal output. A Pigovian tax on its effluent will lower output still further. Buchanan's contribution was to show that while the tax forced the monopolist to economize on smoke production, the further reduction of output could overwhelm the benefits of smoke reduction. Society could be worse off from the tax than without it.

Both Baumol [1965] and Mishan [1965] had previously discussed this type of second best problem. If Buchanan would not have us raise the price of a subsidized factor employed by a monopolist to its social opportunity cost because moving toward this optimal price would lower welfare, would he then be willing to subsidize a factor of a monopolist below its opportunity cost, because moving away from this optimal price increases welfare?

Pigovians would of course like to see the effluent tax and also steps taken to increase competition. Some Pigovians might be willing to take the tax first and bear the burden of welfare loss as a justifiable cost of transition. "One has to begin somewhere."

And to get out of the Lipsey-Lancaster world one has to start with a first step.[1]

Summary and Prelude

Before Coase, the Pigovian doctrine was treated with the uncritical acceptance often given to an unimportant but true analysis. Pigovians focused asymmetrically on the role of the polluter to the exclusion of the receiver. Pigou singled out for observation the actual disservices, pollutants or congestion burdens, which were being transferred from senders to receivers. After Coase elevated opportunity costs to the same ontological level as the disservices themselves, it became customary to treat the whole externality problem symmetrically. In the Pigovian revival difficulties were pointed out in the Coasian doctrine. At the same time further questions of asymmetries were raised. But, as yet, the controversy over Coasian neutrality is still unresolved. In the next chapter we will construct a model from an entirely asymmetrical point of view. We will keep the distinction between active and passive parties, one which is lost in Coasian reciprocity. And in answer to the question "How much should asymmetries in physical damage be taken into account?" we will take the polar position that physical damage (also including direct psychic damage) be the basis for account.

------

[1] See Baumol, "Informed Judgment" [1965, p. 145].